

Appl. No. 10/719,046
Amendment dated Dec. 28, 2005
Reply to Office Action of Nov. 14, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Cancel claims 4, 6-8, and 11-14 without prejudice

Amend claims 1-3, 5, 9, 10 as shown below.

1. (currently amended) A deep hardening Cu/Ni/Cr alloy steel for reducing the cost of high toughness, high strength steels, by eliminating the use of the scarce high cost alloying elements cobalt and molybdenum comprising by weight: about 0.22-0.55% carbon, about 0.40-1.0% copper; about 0.80-3.5% of chromium; about 2.5-8.0% nickel; about 0.55-1.50% of silicon, said silicon and said copper being present in a Si to Cu weight ratio of about 1.2-2.5; about 0.15-1.50% manganese; at least one of the transitional elements, element from the group consisting of vanadium in about 0.10-1.00% by weight and titanium in about 0.10-0.65% by weight; Co and Mo eliminated as alloying constituents; and the remainder iron, ~~carbon~~ and incidental impurities.

2. (currently amended) A deep hardening Cu/Ni/Cr alloy steel for reducing the cost of high toughness, high strength steels by eliminating the use of the scarce high cost

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alloying elements cobalt and molybdenum comprising about 0.40-0.65% by weight of copper; about 0.75-1.50% by weight of silicon, said copper and said silicon being present in a Si to Cu weight ratio of about 1.2-2.5 %; about 1.50-3.50% by weight of chromium; about 1.0-6.0% by weight of nickel; about 0.35-0.50% by weight of carbon before and after deep hardening; about 0.50-1.50% by weight of manganese; at least one of the transitional elements; element from the group consisting of vanadium in about 0.10-1.00% by weight and titanium in about 0.10-0.65% by weight; Co and Mo eliminated as alloying constituents; and the remainder iron and incidental impurities.

3. (currently amended) A deep hardening Cu/Ni/Cr alloy steel for reducing the cost of high toughness high strength steels by eliminating the use of the scarce high cost alloying elements cobalt and molybdenum comprising by weight about 0.22 to 0.55% C, about 0.4 to 1.0% Cu, about 2.5 to 8.0% of Ni, about 0.8 to 3.5% Cr, about 0.50 to 1.5% Si, said copper and said silicon being present in a Si to Cu weight ratio of about 1.2-2.5; about 0.50 to 1.50% Mn; at least one of the transitional elements, element from the group consisting of vanadium in about 0.10-1.00% by weight Co and Mo eliminated as alloying constituents; and titanium in about 0.10-0.65% by weight; the remainder iron and incidental impurities; and characterized by the presence of retained austenite after quenching from an austenitizing temperature, said steel having a microstructure comprised of a major phase of lath martensite enveloped by a minor phase of retained austenite.

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4. (cancelled)

5. (currently amended) A low cost rolled or forged article of high toughness, high strength Cu/Ni/Cr alloy deep hardening steel having after quenching and tempering an HRC hardness of at least 50, a yield strength of at least 200 ksi and an impact strength value 14-eV KCV of at least 28 ft-lb, and consisting essentially of by weight: about 0.50-0.70% of copper; about 0.80-3.50% of chromium; about 2.0-8.0% nickel; about 0.35-0.50% carbon; about 0.75-1.50% silicon, said copper and said silicon being present in a Si to Cu weight ratio of about 1.2-2.5; about 0.65-1.20% manganese; at least one transitional element from the group consisting of vanadium in about 0.10-1.00% by weight and titanium in about 0.10-0.65% by weight; Co and Mo eliminated as alloying constituents; and the remainder iron and incidental impurities.

6. (cancelled)

7. (cancelled)

8. (cancelled)

9. (currently amended) An article manufactured from a low cost, high toughness, high strength Cu/Ni/Cr alloy steel without the scarce high cost alloying elements cobalt and

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molybdenum consisting by weight essentially of: about 0.32-0.55% carbon, about 0.50-1.00% of silicon; about 0.40-1.0% copper, said copper and said silicon being present in a silicon to copper weight ratio of about 1.2-2.5; about 0.80-3.5% of chromium; about 1.0-3.5% nickel; about 0.50-1.00% manganese; at least one transitional element from the group of elements: 0.10-1.0% of vanadium, 0.10-0.65% titanium; Co and Mo eliminated as alloying constituents; and the remainder iron and incidental impurities and having after nitriding an exceptionally deep and hard outer case and high core strength and toughness.

10. (currently amended) A rolled or forged article made from a low cost high toughness, high strength, Cu/Ni/Cr deep hardening alloy steel without the scarce high cost alloying elements cobalt and molybdenum consisting essentially by weight of about 0.35 to 0.50% carbon; about 0.4 to 1.0% Cu, about 2.0 to 8.0% of Ni, about 0.8 to 3.5% Cr, about 0.50 to 1.5% Si, said copper and said silicon being present in a Si to Cu weight ratio of about 1.2-2.5; at least one transitional element from a group of transitional elements consisting of vanadium in about 0.10-1.0% of vanadium by weight and titanium in about 0.10-0.65% by weight titanium, Co and Mo eliminated as alloying constituents; the remainder iron and incidental impurities and characterized by the presence of retained austenite after quenching from an austenitizing temperature, said steel having a microstructure comprised of a major phase of lath martensite enveloped by a minor phase of retained austenite and a hardness of at least HRC 50, a yield strength of at least about

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200 ksi and a Charpy impact value KCV of about at least 28 ft-lb.

11. (cancelled)

12. (cancelled)

13. (cancelled)

14. (cancelled)